Short-Term Capital Flows and Growth in Developed and Emerging Markets.

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Abstract

A lot of attention has been directed towards recent financial crises around the world. It seems that financial markets are prone to herding, panics, contagion and boom-bust cycles. Empirical studies have found that short-term flows increase financial fragility and also increase the probability of financial crises. This study takes a macro-oriented approach and shows that large and volatile short-term flows may be growth inhibiting for emerging markets. This is not the case though for rich countries, where short-term capital flows have no effect on growth. The results in this study indicate that opening up emerging markets capital accounts, which imply increased short-term capital flows, is not a clear-cut way to prosperity.

Keywords: Capital flows, Growth, Financial crises, Panel data
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1 Introduction

For a long time economists held different opinions regarding the importance of the financial sector. As early as 1781 Alexander Hamilton argued that "banks were the happiest engines that ever were invented" and on the opposing side people like president John Adams (1819) said that banks harm the "morality, tranquillity, and even wealth" of nations.[1] Adam Smith himself was positioned somewhere inbetween, but nevertheless pointed out in the *Wealth of Nations* the need for control of the turmoil that follows from the overindulgence of speculative investment by those he called "prodigals and projectors".[2] Today, the amount of literature covering the topic of financial intermediaries as growth promoting is vast. Recent work, theoretical and empirical, has been pointing towards the same direction, namely: well-developed financial markets are good for growth.[3]

There exists however, another strand of literature that concerns financial crises and problems endemic to the financial markets. Market failures may arise due to asymmetric information, incompleteness of contingent contracts bounded rationality and so forth. As a rule, financial crises are not some isolated incidents in the financial markets. They seem to pop up decade after decade, and so do models that try to explain them. The "first generation" of models concerning financial crises was pioneered by Krugman (1979) and focused on fiscal imbalances coupled with fixed exchange rates. The "second generation" of models was suggested by Obstfeldt , in which central banks may decide to abandon the defense of an exchange rate peg when the unemployment costs of doing so become to large.[4] Recent crises in emerging markets have featured troubled financial institutions and sudden reversals of short-term capital flows. The heart of the "third generation" of models, like Chang's and Velascos' (2000), is the banking model of Diamond and Dybvig (1983) where banks take liquid deposits and invest part of the proceeds in illiquid assets. In doing so they pool risk and enhance welfare, but also create the possibility of self-fulfilling bank runs. These models place international illiquidity, which may result in a collapse of the financial system, at the center of the problem. Illiquidity of this kind is defined as a situation in which the financial system's potential short-term obligations exceed the liquidation value of its assets and, may emerge naturally as an optimal response by banks to some features of the economic environment.

Almost all of the countries affected by the financial turmoil the last years had a common characteristic, namely: large short-term capital inflows, both short-term debt as well as portfolio flows.[5] When the capital account reversal came in East Asia it caused a collapse in asset prices and exchange rates. For-

[1] See Beck, Levine and Loyaza (2000).

[2] The term "projector" is used by Smith in a pejorative sense meaning, among other things, "a promoter of bubble companies; a speculator; a cheat." See Sen (1999), Ch1., p. 26, and footnote 19.

[3] See King and Levine (1993), Levine and Zervos (1998), Acemoglu and Zilibotti (1997), Raghuram and Zingales (1998).

[4] See Obstfeldt (1994a), (1994b) and (1996).

[5] IMF's World Economic Outlook (1998) and (2000).

eign creditors called in loans and depositors withdrew funds from banks, which magnified the illiquidity of the domestic financial system. Financial institutions came to the brink of default on their external short-term obligations and the output costs of this crisis have been large.[6]

The purpose of this paper is to analyze whether excessive short-term capital flows are growth inhibiting due to increasing financial fragility and the possibility of a crisis but also because of the large asymmetric information and moral hazard problems associated with these flows. In addition, the question of whether well-developed institutions can help ameliorate the problems caused in the financial markets by short-term flows is taken into account. Standard growth regressions combined with panel data and instrumental variable techniques are used in order to estimate the impact of short-term capital flows on economic growth.[7] Moreover, an extreme-bounds analysis in the spirit of Levine and Renelt (1992) is conducted in order to check the robustness of the results.

This paper is organized as follows. Section 2 provides a more extensive theoretical and empirical motivation for the study. Section 3 outlines the model and methodoligacal issues that provides the basis for the estimations and and Section 4 describes the data. Section 5 presents the results of this paper, while Section 6 investigates their robustness by conducting an extreme-bounds analysis. Section 7 concludes.

2 Theoretical and empirical literature

In this section we will go through the different components needed in order to make the inference that short-term flows are potentially hazardous for growth. The first section is devoted to the effects of financial markets on growth , and the second to financial crises and short-term flows.

2.1 Financial markets and growth

In recent years numerous papers have been written on the links that exist between financial markets and growth. Financial systems and institutions may arise to ameliorate problems created by information and transaction frictions. They facilitate the trading, hedging, diversifying and pooling of risk, they allocate resources, monitor managers and exert corporate control, they mobilize savings, and they facilitate the exchange of goods and services.

There are different channels through which financial systems may affect growth. The most popular being via capital accumulation and technological innovation. Growth models with capital accumulation by Romer (1986), Lucas (1988), Rebelo (1991) and Zilibotti and Acemoglou (1997) use either capital externalities or capital goods produced with constant returns to scale, where factors can be accumulated in order to generate steady-state growth. In these models, the financial system affects growth by influencing the rate of capital

[6] See for example Furman and Stiglitz (1998) and Rodrik (1998) and (2001).
[7] Barro and Sala-i-Martin (1995) and Sala-i-Martin (1997).

formation. The financial system affects capital accumulation by altering the savings rate, by reallocating savings among different capital producing technologies or by allowing the economy to better diversify its investment opportunities. On technical innovation, a second class of growth models by Romer (1990), Grossman and Helpman (1991) and Aghion and Howitt (1992) focuses on the invention of new production processes and goods. In these models, the financial system affects the steady-state growth by altering the rate of technological innovation.

Empirical findings in recent years have shown that well-functioning stock markets and banks promote long-run economic growth. The main channel linking financial development with growth runs through productivity growth rather than capital stock growth. Financial intermediaries exert a positive impact on TFP growth, which feeds through to overall GDP growth.[8] On the other hand the long-run links between financial intermediary development and both physical capital growth and private savings rate are, at best, tenuous. The evidence is consistent with the view that the ability to trade ownership of an economy's productive technologies easily promotes more efficient resource allocation, capital formation, and faster economic growth. It is not just listing securities on an exchange; it is the ability to trade those securities that is closely tied to economic performance.

Another important link that has been analyzed is the legal and regulatory determinants of financial intermediary development. Since contractual arrangements form the basis of financial activities, legal systems that protect creditors and enforce contracts are likely to encourage greater financial intermediary development than legal and regulatory systems that impede creditors from gaining access to their claims or that ineffectively enforce contracts. A paper by Ross Levine (1997) finds that countries with legal systems that assign a higher priority to creditors extracting the full present value of their claims against corporations in the case of bankruptcy or reorganization have more developed financial intermediaries. Also, countries with legal systems that more effectively enforce contracts have better developed financial intermediaries. Furthermore, there is a strong positive link between financial intermediary development and the degree of corporate information disclosure.

By and large, a good legal and regulatory environment seems to mitigate problems endemic to the financial markets and promote the development of financial intermediaries. Moreover, well-developed financial systems promote long-run growth through higher productivity growth.

2.2 Financial crises and short-term capital flows

Short-term capital flows do not carry any intrinsic threat towards an economy or the financial markets. In many cases they may even have a positive impact on an economy. One key issue does arise though; towards what ends are these short-term capital flows used. Financial markets are, in some respects, fundamentally

[8] See King and Levine (1993).

different than markets for goods and services. Here market failures arise due to asymmetric information, incompleteness of contingent contracts, bounded rationality and so on.[9] These failures are endemic to the financial markets and it seems that what would have been mistakes with minor consequences in a closed economy can become magnified into a major crisis in an open economy.[10]

A counter-argument is that financial markets are correct in their judgement most of the time, and that sharp reversals of capital flows are usually the result of change in fundamentals, such as external shocks or policy mistakes.[11] This argument is, at best, shaky. It is known that financial market volatility is well beyond what can be explained by movements in fundamentals. While at least some fundamentals surely underlie every financial crisis, the magnitudes of the crises, according to Rodrik (1998), are often disproportionate with any plausible change in the fundamentals.[12] There are, for example, no known changes in fundamentals that could possibly account for the sharp reversal of capital flows towards Asia in 1997.[13]

There are several papers that treat the topic of causes of financial crises. Demirgüc-Kunt and Detragiache (1998) find strong evidence in favour of the common belief, that financial liberalization makes crises more likely. They also find that crises could be, to some extent, mitigated by institutional development. They note that "country experience suggests that the benefits of financial liberalization may have to be weighted against the cost of increased financial fragility."

Financial liberalization per se, should not have any effect on the financial systems fragility. The increased fragility comes through variables that increase disproportionately with the liberalization implementation. In general, studies show no statistically significant relationship between growth or investment and capital account liberalization.[14] One contributing factor to this increased fragility is that, full capital account liberalization often means larger short-term borrowing. Some short-term capital is essential for the economy to run. If savings are low, and investment misallocation is not marginal then the additional short-term capital flows can play an important role in an economy's future. If this is not the case though, then the main effect of additional short-term capital flows is to increase the vulnerability of the economy. The most productive investments are long-term, and the mismatch between the maturity of assets and liabilities can give rise to serious problems. The net benefits appear even smaller when the reserves set aside to protect against the volatility of short-term

[9] See for example Stiglitz and Weiss (1981).

[10] See Bacchetta and Caminal (2000), Bacchetta and Wincoop (1998).

[11] See Rodrik (1998), Frankel and Rose(1996).

[12] This concerns secondary markets, Shiller (1989).

[13] In 1996, five Asian countries (Thailand, Korea, Indonesia, Malaysia and the Phillipines) received net private capital inflows of approximately $ 93 billion. In 1997, they experienced an outflow of approximately $ 12 billion, which is quite a turnaround in one year. This indicates that commercial banks either got it terribly wrong in 1996 and earlier or, they were terribly wrong in completely pulling out thereafter.

[14] For a survey see Edison et al. (2002).

capital are taken into account.[15] A recent paper by Eichengreen and Leblang (2003) however shows that capital controls have a significantly positive effect on growth in periods of financial instability but negative when crises are absent and the controls affect the resource allocation in an economy, suggesting hence that the net effect of controls is context specific and that potential capital account liberalization benefits dominate the costs when the domestic financial system is robust and the international system is not prone to crises.

Here it is important to note the distinction Meade (1951) made between 'temporary' and 'continuing' capital movement, where the key underlying notion behind this distinction is that of reversibility, the risk that capital pulled in by certain temporary factors could flow out once the attractions waned. An empirical study by Turner (1991) established a stability ranking in the following order: long-term bank loans, foreign direct investment, investment in bonds, investment in shares and lastly short-term credit. Moreover, Chuhan et al. (1996) provide empirical evidence in support of the view that short-term flows are 'hotter' than FDI.

Also relevant, for the moral hazard and asymmetric information problems, are the incentives within internationally active organizations to maximize short-term gains. For example UK external manager's have mandates for around three years and may lose them if they have not performed sufficiently well; monitoring is typically done every three months. The US time horizons seem to be even shorter, with very frequent monitoring and possible changes of mandates every one to two years. Moreover, fund managers fees in these countries are related to the value of funds at year-end or they are even more directly performance related. All this increases the potential for volatility as fund managers cannot 'afford' to make losses and/or to perform worse than average.[16]

A recent study by Rodrik and Velasco (1999) provides a conceptual framework for evaluating the effects of short-term capital flows. A model with joint determination of maturity and the cost of external borrowing, highlights the role played by self-fulfilling crises. The empirical analysis shows that the short-term debt to reserves ratio is a robust predictor of financial crises, and that greater short-term exposure is associated with more severe crises when capital flows reverse. Their evidence is consistent with the idea that illiquidity makes emerging-market economies vulnerable to panic. Regardless of fundamentals, a large exposure to short-term debt intensifies the cost of a crisis because it magnifies the current-account adjustment and currency depreciation that needs to be undertaken. This was clearly shown in the crisis countries in East Asia where external debt levels where relatively low, but the levels of short-term debt relatively high. The crises were caused in part by the refusal of lenders to roll over these short-term loans. Moreover, there is a high cost, beyond the budgetary cost of bailouts, associated with the economic disruption that follows from financial crises: the one of growth slowdown after a crisis.

The papers above share the common feature that financial crises are driven

[15] See Rodrik (1998), Rodrik and Velasco (1999), Chang and Velasco (2000), Furman and Stiglitz (1998).

[16] See Stephany Griffith-Jones (1998).

by the illiquidity of banks, which makes them more relevant for emerging markets. It makes them so, because banks play a much larger role in emerging markets than in mature economies and because emerging markets access to world capital markets is more limited.

Another recent theoretical paper by Aghion et al. (2000), emphasizes the role of financial factors as a source of instability in small open economies. This model differs from the models discussed above in the sense that financial distress is not driven by bank illiquidity, but rather through changes in relative prices between an economy's tradeable and nontradeable sector.

The basic model is a dynamic open economy model with one tradeable and one non-tradeable good. The non-tradeable is used as an input to the production of the tradeable and firms face credit constrains that depend on the level of financial development. The underlying mechanism in the model is a combination of two forces: first, more investment leads to more output and c.p., to higher profits. Higher profits improve creditworthiness and fuel more borrowing, which leads to more investment. Capital, that is not FDI, flows into the country to finance this boom. The boom in investment increases the demand for the non-tradable input and raises its price relative to the tradeable good. This rise in prices leads to lower profits in the tradeable sector and therefore, reduced creditworthiness, less borrowing and less investment and a fall in aggregate output. The two basic implications of this model are the following: first, economies at an intermediate level of financial development are more unstable than either very developed or very underdeveloped economies.[17] Second, in economies at an intermediate level of financial development, full financial liberalization may actually destabilize the economy. The common ground for the illiquidity based models and this model is that in both cases the drop in output due to financial market malfunction will occur only occur in emerging markets and not in developed economies.

Ultimately, we can say that the above analysis indicates that while financial markets as an entity are probably good for growth, parts of these financial markets have a more dubious effect on growth and in the case of emerging markets, possibly a negative one. A major candidate for these dubious effects are short-term capital flows, which tend to have more pronounced moral hazard and asymmetric information problems attached to them than long-term flows.

2.3 Some stylized facts.

There is a long list of possible determinants for the maturity structure of capital flows. Short-term flows can have a useful role to play in fostering efficient financial intermediation. It is expected that both demand and supply for maturity-

[17] The reason why an intermediate level of financial development is important for this result should be easy to see: at very high levels of financial development, most firms investment is not constrained by their cash flow. Therefore shocks to cash flow are irrelevant. On the other hand, at very low levels of financial development, firms cannot borrow very much in any case and therefore their response to cash-flow shocks will be rather muted. Shocks will die out without causing any great turmoil. It is then at intermediate levels of financial development that shocks will have a strong enough effect to be a source of instability.

transformation services to increase with financial sophistication, and the volume of short-term flows should also increase with the openness of an economy.[18]

Government choices of regulatory policies are also important. Governments have at their disposal a range of financial and regulatory policies that influence the structure of capital flows, and their policies often stimulate short-term capital flows. The Basle capital adequacy standards, for example, encourage short-term cross-border lending to non-OECD economies by attaching a lower risk weight to short-term loans. The Thai government set up The Bangkok International Banking Facility in 1993, which specifically aimed at attracting short-term funds from abroad. The Korean government is often blamed for having encouraged short-term inflows by making longer-term investments in Korea difficult for foreigners. We can see below, in Table 1 how short-term flows essentially exploded during the 90's in several East-Asian countries, with the Korean increase of 928 percent at the top.[19]

Table 1: The Development of Short-Term Capital Flows in East-Asian countries.

	(Million U.S $)					
	Average Short-term Flows			St. Dev. of Short-term Flows		
Country	1979-90	1991-96	1997-00	1979-90	1991-96	1997-00
Korea	1061	10891	16269	950	7245	6001
% increase between periods		926%	49%		663%	−17%
Malaysia	794	1407	1392	574	840	1672
% increase between periods		77%	−1%		46%	99%
Singapore	1946	7325	17120	2295	4796	15815
% increase between periods		276%	134%		109%	230%
Thailand	1475	4879	6455	1617	2647	2658
% increase between periods		231%	32%		64%	4%

Limits on the short-term foreign liabilities of domestic banks, deposit requirements on capital inflows, and restrictions on the sale of short-term to foreigners are examples of policies that can reduce short-term capital inflows. Chile's capital-account regime represents a canonical case of successfully changing of a country's maturity composition of flows, and has been studied extensively. The Chilean authorities imposed a time dependent reserve requirement on all external credit except equity investments. Evidence in a number of papers find that the restrictions have affected the maturity composition of flows, though not their overall volume. This, together with solid fundamentals and a sound

[18] See Rodrik and Velasco (1999).

[19] The definition of short-term capital flows in this paper is found in chapter three, Tables 1 and 2 shows short-term capital flows in absolute figures, hence no distinction is beeing made between inflows and outflows. See also figures in Appendix II to see the development of short-term flows over time. The different time periods are reported with respect to financial liberalization and occurred financial crises. The country selection goes to show the differences within some regions.

financial system, are probably the main causes that Chile was not affected by the Mexican 'tequila' crises in 1995.[20] We can see in Table 2 that Chile had an increase of only 64 percent of short-term flows in the beginning of the 90's. This can be compared with increases ranging from 200 up to 450 percent in other Latin American countries.

Table 2: The Development of Short-Term Capital Flows in in L.-A. countries.

	(Million U.S $)					
	Average Short-term Flows			St. Dev. of Short-term Flows		
Country	1979-90	1991-96	1997-00	1979-90	1991-96	1997-00
Argentina	2414	7166	6520	1926	7897	2745
% increase between periods		197%	−9%		310%	−65%
Brazil	2764	15397	7028	2427	15970	5255
% increase between periods		457%	−1%		558%	−67%
Chile	816	1341	2721	547	409	1427
% increase between periods		64%	103%		25%	249%
Mexico	4820	15259	7464	4108	8832	4124
% increase between periods		213%	−51%		64%	4%

3 Methodology

Growth theory suggests that growth is driven by accumulation, therefore a basic growth regression should include measures of growth in production factors: physical capital, labor and human capital, that is $Y = F(K, L, H)$, where the conventional notation applies. Since the dependent variable will always be growth of GDP per capita the growth of the labor force will be included implicitly in the regressions. The regressions below will include, real investment as a share of GDP and the rate of accumulation of human capital. This choice of explanatory variables can be derived from an aggregate production function for endogenous growth models or the augmented Solow-Swan model . Further, given the support for conditional convergence in the empirical growth literature a measure of initial income, which can be derived directly from the Solow-Swan model will also be included among the regressors, where both endogenous growth models and the Solow-Swan model predict that the measure of initial income will have a negative effect on growth. However, the endogenous growth models predict a positive impact of human capital on growth due to imbalances between physical and human capital, whereas the Solow-Swan model predicts a negative impact due to diminishing returns to reproducible factors.[21] In addition to the traditional variables in growth regressions our model will include some measure of short-term capital flows (X), and other appropriate control variables (Q). Hence a general form of our regression can be expressed as:

[20] Valdes-Prieto and Soto (1996), Budnevich and Lefort (1997), Larrain, Laban and Chumacero (1997), Montiel and Reinhart (1997). De Gregorio, Edwards and Valdéz (2000).

[21] See Barro and Sala-I-Martin (1995), Mankiw, Romer and Weil (1992).

$$\Delta y = f\left(y_0, h, k, X, Q\right) \tag{1}$$

This equation tells us that a country's per capita growth rate will depend on some initial output, the rate of accumulation of human capital, the rate of capital accumulation, our variable of interest (X) which in this case is some measure of short term capital flows and a set of control variables (Q).

We use a panel data approach in order to avoid certain econometric difficulties. Firstly, if regressions are based on average values of growth and short-term capital flows over long time periods, there is a potential simultaneity problem. Over long time periods the level of short-term flows is likely to be influenced by the development of financial markets, which is highly correlated with growth and GDP. This means that if financial markets develop faster over a twenty or thirty year period, growth and GDP will be higher, but the development of financial markets also affects short-term capital flows. As a result the independent variable may be correlated with the error term in the growth regression. Moreover, panel regressions are more efficient since they take into consideration information that comes from time variation.[22] This takes us to the problem of choosing the period length in the panel data. Time-periods that are too short, such as annual observations, give rise to multicollinearity problems, hence the ever present question of optimal lag length of the explanatory variables. Furthermore there is, in panel regressions, the occurrence of short-term co-variation, like business cycles, which might constitute a problem. In order to avoid most problems and reap the benefits of panel regression we use *non overlapping 5-year period averages*. The reasons for choosing non overlapping 5-year period averages are several. Firstly, it mitigates the problem of long-run simultaneity. Secondly, the problem of cyclical co-variation is hopefully removed by using period dummies, in addition to the five-year period averages and thirdly, most financial crises that have occurred during the examined time period have been within five years of a country's financial liberalization.[23]

The time variation of the data is in this case particularly interesting, since the time period when countries liberalized their capital accounts, and confronted increased short-term capital flows, varies significantly. An additional reason for using a panel data approach lies in the ability to allow for differences in the aggregate production function across countries. Panel data methods also increase the number of observations and enhance therefore the statistical basis for conclusions. Important to note is also that a panel data approach mitigates, to some extent, the simultaneity problem. Since the period of observation is shorter, it is less likely that the error in the growth regression will affect the short-term capital flows in the same period.[24] However, using panel data in growth regressions brings forth the issue of dynamic paneling. Since initial income appears on the right hand side we have a part of the dependent variable

[22] See Levine and Zervos (1998), Beck et al. (2000).
[23] See Fölster and Henrekson (1999) and (2001), Mehrez and Kaufmann(2000).
[24] See Islam (1995).

as an explanatory variable. This problem is resolved by using 'out of sample' data to instrument for y_{t-1}, and making it a strictly exogenous variable.[25]

An issue in panel data concerns the presence of heteroscedasticity in several dimensions. One form of heteroscedasticity appears in time-series, when variables are drawn from different distributions and the error-term spread is too large. This can easily be amended with common corrections such as White (1980) and Newey-West (1987). Another form of heteroscedasticity can be the one between countries. The largest country in the sample is 60 times larger than the smallest in terms of their population, and growth tends to vary less in large countries than in small ones. One standard solution to this is to weight countries in such a manner that the weight attached to each country is inversely proportional to the standard deviation of the error term.[26] The fact that we can rarely be certain about the nature of cross-section heteroscedasticity is, according to Greene (1999), a minor problem since weighted least squares estimators are consistent regardless of the weights used, as long as the weights are uncorrelated with the disturbances. In our case, tests show that the data does not exhibit any heteroscedasticity in the time dimension but well within the panel dimension.[27]

Even if some econometric problems can be corrected the suspicion of endogeneity in some of the right-hand side variables will always be present. To cope with the possibility of endogeneity seems to be a challenge for the literature of empirical growth economics and we will try to address this problem to some extent. One potential advantage is perhaps that, as mentioned earlier, it is easier to argue that the development of growth in a country causes short-term capital to flow in or out of the country.[28] But it is much harder to argue that growth will have an effect on the volatility of short-term capital flows. If one still believes that there is cause to worry about endogeneity problems in the variable of interest, several instrumental variable techniques are employed to come to terms with the endogeneity issue. As usual, the problem of finding adequate instruments, without losing too many degrees of freedom in the regressions will of course be present.

[25] Penn World Table 6.1 has for most countries data from 1950 or 1951 and onwards for Real GDP. For some countries, like Singapore, the series start around 1960 and the time interval is 3 years instead of 5. The instrument has an explanatory power larger than 90 percent.

[26] See Baltagi (2001) Ch. 5 and Greene (1999) Ch.12.

[27] LM tests for heteroscedasticity within panels give a $\chi^2(1)$ value of 2.5 and we can not reject the null of constant variance. In the panel dimension however, the LR tests produce a χ^2 (33) value of above 90 in all occasions which clearly rejects the null. Moreover, tests of autocorrelation in the error terms, Wooldridge (2002) and Drukker (2003), accept the null of no autocorrelation, in the regressions. All panel estimations are conducted with White heteroscedasticity-consistent standard errors and covariance.

[28] Celasun, Denizer and He (1999) find that the growth rate of real GDP, does not affect short-term or total capital flows.

4 Data

Two measures of short-term capital flows volatility will be used in order to assess the impact on growth.[29] The first is short-term capital flow volatility as a share of GDP, which is a quite intuitive way to measure the impact of short-term capital flows in an economy and is related to the model of Aghion et al. (2000). The second measure is the ratio of short-term capital flow volatility to reserves, which is more connected with the effects of short-term capital flows impact on the financial sector. Even though this variable is not a very good measure of solvency, nor is it easily linked to the health of the economy, it is nevertheless important for three reasons. First, the ratio measures a country's vulnerability to a Diamond-Dybvig bank run, since it measures liquidity. Second, a high ratio may signal imprudent macroeconomic or regulatory policies . Third, the ratio of short-term inflows to reserves is an indicator of the vulnerability of a country to a self-fulfilling capital withdrawal.[30]

The volatility measure also allows the possibility of an additional interpretation. If the volatility has positive impact on growth, it can be viewed as having well functioning financial markets that put funds to their most productive use. If, on the other hand, the volatility measure has a negative impact on growth, then we have poorly performing financial markets. An additional merit of the volatility measure is that it's less prone to simultaneity bias. It is easier to argue that the development of growth in a country causes short-term capital to flow in or out of the country. But it is clearly harder to argue that growth will have an effect on the volatility of short-term capital flows.

The set of control variables includes a measure of capital controls. This variable for capital account restrictions is also interesting in its self, since a lot of current research is being conducted on the topic of the effects on growth due to capital account liberalization.[31] Furthermore it is also an indication of fixed versus floating exchange rate, and it will also control for the time period a country has liberalized its capital account. An additional control variable in the regressions is a measure of a country's openness to trade, which has often been found to affect growth.

The data in this study is constructed for the years 1970-2000, depending of course on data availability. To fill gaps in the series, all time varying variables are averages over non-overlappig five-year periods. The dependent variable in the regressions will always be the average annual growth rate of GDP per capita in constant prices ($\Delta y_{i,t}$) and is computed using data from *Penn World Table 6.1* (PWT 6.1) as:

[29] Easterly, Roumeen and Stiglitz (2000) find that private capital flows volatility increases growth volatility, which is negatively correlated with growth.

[30] Furman and Stiglitz (1998) comment on this variable and say that: "The ability of this variable, by itself, to predict the crises of 1997 is remarkable". Also they comment on the fact that the higher this ratio is, the more likely it is that a country is pursuing other problematic policies.

[31] A note of caution is in order since capital controls come in various shapes and forms, the measure used here is a crude and imperfect proxy for what we may try to capture.

$\Big((y_E/y_B)^{1/(E-B)} - 1\Big) * 100$ (B=beginning of period, E=end of period). Other variables that will always be included in the regressions are:

inY Initial income which is measured as the log of real GDP per capita, in current international $ and is reported with the initial year for each subperiod.

$Edu.$ The rate of accumulation of human capital is measured as average schooling years in the total population over age 25 and is reported with the initial year for each subperiod. The data are from Barro and Lee found in Harvard/CID homepage.

$Inv.$ Investment ratio, which is calculated as the period average of real investment as a share of GDP for each subperiod Data form PWT 6.1.

$RES.$ Reserves are measured as total reserves plus gold. Data from IFS/IMF of disk.

$CAR.$ The measure of capital account restrictions will follow Dani Rodriks (1998) guidelines and will be the proportion of years, in every subperiod, for which the capital account was free of restrictions. For the developing countries I have used the data of Kim (1997) in Rodrik (1998), and complemented for recent years using IMF annual reports on exchange restrictions. For developed countries I have used information from Mehrez and Kaufmann (2000) in order to create the variable.

$OPEN.$ The second control variable, which is the sum of exports and imports of goods and services measured as a share of gross domestic product in real terms. Data from PWT 6.1.

These are all quite common definitions of variables when conducting similar growth estimations. When it comes to the variables of interest, namely short-term capital flows, things get a bit more complicated, lack of adequate and available data and different constructions of variables, all with their own advantages and disadvantages are to be found.[32] The measure for short-term capital flows (STF) that will be used is from Sachs, Tornell and Velasco (1995) and has been augmented to include banks as well. It is constructed from IMF's 'Balance of Payments Statistics' by adding the following lines:[33]

- **4600 Portfolio Investment**
- **4998 Errors and Omissions**
- **Other investment: Assets**
- 4724 Loans, Banks, of which short-term
- 4727 Loans, Other sectors, of which short-term
- 4733 Currency and deposits, Banks
- 4734 Currency and deposits, Other sectors

[32] See Furman and Stiglitz (1998), Arteta, Eichengreen and Wyploz (2001).

[33] Since this is a Balance of Payments Statistics, net inflows are positive and net outflows are negative, irrespective of whether they are classified as assets or liabilities.

- **Other investment: Liabilities**
- 4768 Loans, Monetary Authorities, of which short-term
- 4771 Loans, General Government, of which short-term
- 4774 Loans, Banks, of which short-term
- 4777 Loans, Other sectors, of which short-term
- 4789 Other liabilities, Monetary authorities, of which short-term
- 4792 Other liabilities, General government, of which short-term
- 4795 Other liabilities, Banks, of which short-term
- 4798 Other liabilities, Other sectors, of which short-term

The volatility measurement that is constructed from these short-term capital flows and that will be used in the regressions is of the following form:

$$VSTF = \frac{1}{n} \sum_{0}^{n} \left| STF_t - STF_{t-1} \right|,$$

where n is the number of years in each subperiod. One advantage of the above construct is that apart from the volatility it also captures a level effect of short-term capital flows in the economy.

When it comes to country selection it is known that mixing rich and poor countries does not represent a good test of what theory predicts, if there are reasons to believe that markets, in this particular case the financial markets, behave differently in developing countries compared to rich countries. This study will include the richest developed and developing countries, divided into two sub-samples. The prerequisite being that the countries have a, more or less, functioning financial sector. A total of 38 countries where included, but due to data availability, or lack thereof, a final selection of 34 developed and developing countries were selected.[34] The cutoff point for this selection is the poorest OECD country, measured with GNP per capita PPP adjusted, which is Turkey; the measurement is prior to the 1995 Latin American crises, and all oil producing countries and tax evasion paradises are excluded from the sample. So, the rich countries selected are: Australia, Austria, Canada, Denmark, Finland, France, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States, and the developing countries are: Argentina, Brazil, Chile, Colombia, Israel, Korea, Malaysia, Mauritius, Mexico, Singapore, Thailand, Turkey, Uruguay, Venezuela.

[34] Excluded countries due to data shortage are Belgium, Germany, Hong Kong, and Luxembourg.

5 Results

The basic formulation of the model developed in the previous section will be applied firstly in a pure cross-country framework on a sample of 34 developed and developing countries with the following form:

$$\Delta y_{70,00} = c + \beta_1 y_{70} + \beta_2 h_{70} + \beta_3 k_{70,00} + \beta_4 X_{70,00} + \beta_5 Q_{70,00} + \varepsilon \qquad (2)$$

where GDP per capita growth between 1970 and 2000, $(\Delta y_{70,00})$, depends on initial GDP per capita, (y_{70}), on the initial level of education, (h_{70}), on the investment share of GDP, $(k_{70,00})$, on average values of our variables of interest, $(X_{70,00})$, and finaly on average values of our control variables for the period in question, $(Q_{70,00})$. The results are presented in Table 3.

Table 3: Regressions for the effects of Short-Term capital flows on growth, 1970-2000.

	Cross country regressions					
	All Countries	All Countries	Rich Countries	Rich Countries	Developing Countries	Developing Countries
InY	-1.59^{***}	-1.52^{***}	-2.44^{**}	-2.35^{*}	-3.77^{***}	-2.63^{**}
	(3.96)	(4.18)	(2.24)	(2.09)	(4.44)	(2.63)
INV	0.07^{**}	0.07^{**}	0.05	0.06	0.02	0.05
	(2.08)	(2.13)	(0.91)	(1.02)	(0.52)	(1.20)
EDU	0.25^{**}	0.22^{**}	0.13	0.10	0.60^{**}	0.40^{**}
	(2.20)	(2.10)	(0.96)	(0.70)	(2.91)	(2.31)
VSTF/RES	−0.59		−0.85		1.82	
	(0.87)		(0.96)		(1.38)	
VSTF/GDP		-21.54^{*}		−2.19		-50.78^{*}
		(1.83)		(0.16)		(2.19)
CAR	0.53	0.57	−0.08	−0.20	1.79	1.12
	(0.74)	(0.83)	(0.10)	(0.23)	(1.70)	(1.12)
OPEN	0.01^{**}	0.02^{***}	0.02^{*}	0.02	0.03^{***}	0.03^{***}
	(2.28)	(2.88)	(1.82)	(1.11)	(3.21)	(3.92)
Obs.	34	34	20	20	14	14
$R^2_{adj.}$	0.53	0.57	0.25	0.20	0.79	0.83

Note: *, ** and *** denote significance at the 10, 5, and 1% levels respectively, |t|-ratios in parentheses. All regression include a constant.

The results from Table 3 do not seem to give any particular significant effect of short-term capital flows. In the words of Rodrik (1998): "If there is a correlation... it does not jump out from the table". The variables $(VSTF/RES;\ VSTF/GDP)$ are essentially uncorrelated with long-term economic performance once other determinants are controlled for. Even if $VSTF/GDP$ is marginally negative significant there are too few observations and moreover the significance disappears if other variables are included in the equation. The standard growth

regression variables such as Education, Investment, Initial Income and Openness are all significant in the full sample regressions, which validates the model specification.

In order to exploit the time variation of our variables of interest we turn over to our panel estimations. These panel will take on a number of forms in order to address several econometric issues that arise with each form of estimation. However, we can make some a priori hypotheses about our results, since theory gives some guidance for the effect of short-term capital flows on growth and it also gives guidance regarding how empirical studies should be specified. For example, both Aghion et al. (2000) as well as Chang and Velasco (2000) claim that one should find a negative effect only in emerging markets, i.e. markets that do not have a very high level of financial development.

Table 4 presents the first regression results of panel data estimations. Our observations consist of non-overlapping five-year periods in an unbalanced data set. All regressions include period dummies in order to prevent spurious correlation and are corrected for heteroscedasticity across panels.[35] Moreover, in order to avoid biases due to dynamic paneling the initial income variable is instrumented by using out of sample values as instruments. In the first panel the estimations do not include country dummies and investment, education, openness are instrumented by their lagged values in order to avoid endogeneity issues. These estimations will however suffer from omitted variable bias, since country specific effects account for observable and unobservable effects that are constant over time. The second panel in Table 4 includes country specific effects which, while correcting for the omitted variable bias, automatically create issues of potential endogeneity bias, since the within-estimations have an error term that contains an average of all time periods. Hence, lagged variables are no longer valid instruments and the estimations are conducted on contemporaneous levels, with the exemption of initial income, which is instrumented by out of sample data and is still valid. The discrete time model used for estimations in Panel I and Panel II respectively can be expressed as:

$$\begin{aligned} \Delta y_{i,t} &= c + \delta_t + \beta_1 y_{i,t-1} + \beta_2 h_{i,t-1} + \beta_3 k_{i,t-1} + \beta_4 X_{i,t} \\ &\quad + \beta_5 Q_{i,t-1} + \varepsilon_{i,t} \end{aligned} \tag{3}$$

$$\begin{aligned} \Delta y_{i,t} &= \alpha_i + \delta_t + \beta_1 y_{i,t-1} + \beta_2 h_{i,t} + \beta_3 k_{i,t} + \beta_4 X_{i,t} \\ &\quad + \beta_5 Q_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{4}$$

Even if all the estimations in Table 4 have their own potential deficiencies they do however show some interesting trends concerning our variables of interest.[36]

[35] The results do not hinge on the correction of heteroscedasticity accross panels. They are extremly robust accross a variety of estimation methods.

[36] Hausman tests tend, in general, to reject the null of no differences between the two models when $VSTF/RES$ is used, but not for $VSTF/GDP$.

Table 4: Five-year period Regressions for the effects of Short-term capital flows on growth.

	Weighted Panel Data Regressions 1970-2000. No fixed effects					
Panel I	*All Countries*	*All Countries*	*Rich Countries*	*Rich Countries*	*Developing Countries*	*Developing Countries*
InY	-0.65^{**}	-0.67^{**}	-1.12^{**}	-1.14^{**}	-1.47^{**}	-2.01^{***}
	(2.09)	(2.15)	(1.98)	(1.98)	(2.48)	(3.40)
INV	0.06^{**}	0.05^{**}	0.04	0.04	0.10^{***}	0.07^{**}
	(2.39)	(2.12)	(1.03)	(1.18)	(2.87)	(2.26)
EDU	0.05	0.07	-0.04	-0.04	0.13	0.29^{**}
	(0.84)	(1.09)	(0.71)	(0.63)	(1.11)	(2.43)
VSTF/RES	0.05		0.15		-2.45^{***}	
	(0.28)		(0.82)		(3.70)	
VSTF/GDP		-6.32		5.60		-35.73^{***}
		(1.26)		(1.24)		(4.01)
CAR	-0.11	-0.13	-0.23	-0.25	-0.08	0.85
	(0.34)	(0.39)	(0.84)	(0.95)	(0.14)	(1.51)
OPEN	0.005^{**}	0.01^{**}	0.01	0.003	0.003	0.02^{***}
	(2.14)	(2.55)	(1.43)	(0.73)	(0.72)	(4.74)
$R^2_{\cdot}$	0.19	0.20	0.26	0.27	0.51	0.55
Obs.	170	170	100	100	70	70
	Weighted Panel Data Regressions 1970-2000. Fixed effects included					
Panel II	*All Countries*	*All Countries*	*Rich Countries*	*Rich Countries*	*Developing Countries*	*Developing Countries*
InY	-1.07^{**}	-1.05^{*}	-1.22^{**}	-1.24^{**}	-0.18	-0.68
	(2.02)	(1.94)	(2.55)	(2.51)	(0.20)	(0.73)
INV	0.07^{**}	0.07^{**}	0.05	0.04	0.01	0.03
	(2.24)	(2.27)	(1.25)	(1.09)	(0.16)	(0.86)
EDU	0.02	0.03	-0.03	-0.04	0.17	0.75^{***}
	(0.10)	(0.16)	(0.20)	(0.26)	(0.68)	(2.92)
VSTF/RES	-0.12		-0.03		-3.76^{***}	
	(0.65)		(0.25)		(6.49)	
VSTF/GDP		-0.98		0.30		-40.00^{***}
		(0.20)		(0.07)		(5.43)
CAR	-0.40	-0.40	-0.77^{***}	-0.75^{***}	-0.03	-0.07
	(1.42)	(1.41)	(3.19)	(3.08)	(0.06)	(0.12)
OPEN	0.01^{*}	0.01^{*}	0.06^{***}	0.06^{***}	-0.01	-0.02^{***}
	(1.77)	(1.74)	(4.81)	(4.37)	(1.10)	(2.67)
$R^2_{\cdot}$	0.45	0.45	0.55	0.55	0.69	0.65
Obs.	186	186	110	110	76	76

White heteroskedasticity-consistent standard errors and covariance. Time dummies included in all regressions.
Note: *, ** and *** denote significance at the 10, 5, and 1% levels respectively.

In the first two columns, when all countries are in a common pool, we see that short-term capital flows have no strong significant effect on economic growth. On the other hand, when one divides the countries into two subsamples, different patterns begin to emerge. We see that the impact of short-term capital flows on growth, $(VSTF/RES; VSTF/GDP)$, seem to follow the theoretical predictions that were presented previously and have a strong negative impact for developing countries, while not affecting rich economies.

A review of the results in Table 4 presents us with a variety of results. However, one result that is robust is the effects of short term capital flows on growth. These variables seem to be insignificant for the whole sample as well as the sample containing only rich countries. On the other hand, for the sample of emerging markets the results are negative and highly significant. The first variable of short-term flows to reserves indicates that emerging markets suffer from illiquidity problems within their financial sector, which makes, according to theory and empirical observation, financial crises more likely and therefore hampers long run growth. The second variable, which measures short-term flows to GDP has also a significant negative effect on growth. This result is in line with the predictions from the theoretical work of Aghion et al. (2000), where intermediate levels of financial development are unstable, due to emerging market firms cash-flow constraints, and can cause financial distress.[37]

Rich countries seem to follow somewhat the neoliberal orthodoxy, in the fixed effects setting, in the sense that capital account restrictions are significantly negative for growth and increased openness to trade is good for growth. The results obtained that refer to the developing sample differ somewhat in their indications and possible explanations. Firstly, we see that increased trade has a negative impact on growth in Panel II and a positive impact in Panel I. Secondly, we see that the variable of capital account restriction is insignificant in both specifications. However, a small note of caution about the CAR variable might be in order here since it is a crude and imprecise measure and might not fully capture all the properties of interest.

Finally, even if the problem with dynamic paneling is avoided above there are still a number of estimation problems with their respective biases that have to be addressed. Due to these problems the results can, at this stage, only be viewed as correlations and give us only indications of potential trends. In order to avoid potential biases we have to move on to instrument regressions.

5.1 IV-Estimations

The first step in the instrument approach is try and rid our estimations of the endogeneity problems that occur due to country specific effects. A simple differencing, $\Delta growth_t = f(\Delta x_t)$, of the regression removes the country specific effects. This rids us of the potential omitted variable bias without changing the underlying effects of the explanatory variables on growth. However, since the

[37] It may also be and indication of badly functioning financial markets, where capital is not put to its 'most' productive use.

dependent and independent variables are in contemporaneous time periods, the potential for endogeneity still exists and we need to find valid instruments for our explanatory variables. We can utilize the fact that lagged levels, (x_{t-2}), or lagged differences, $(x_{t-2} - x_{t-3})$, of our variables may be valid instruments and utilize methods proposed by Anderson and Hsiao (1982) (AH) to estimate our regressions. One general problem with the AH instruments though is that they tend to be inefficient. To improve our instruments we can use the GMM method proposed by Arellano and Bond (1991), called the 'difference' estimator where, for each observation in the data we can use the maximum available lags as instruments. However, even if the 'difference' estimator uses more information than AH, lagged levels are still potentialy inefficient as instruments for differences. We can then turn to an additional GMM method, called the 'system' estimator. The 'system' estimator is an expansion of the 'difference' estimator made by Arellano and Bover (1995) and Blundell and Bond (1997). In addition to the 'difference' approach, the 'system' estimator includes also, lagged differences as instruments for the levels of our variables. The 'system' estimator is utilized in Beck et al. (2000) as well as Eichengreen and Leblang (2003) for similar exercises and seems to be the most efficient in terms of instrumenting. The general drawback in all these instrumental approaches lies in the loss of degrees of freedom. The differencing and lagging of our variables reduces our degrees of freedom that are available for statistical inference. However, the results obtained from these IV approaches coupled with the results from Table 4, which we can use as some form of benchmark, provide strong indications of the effects of short term capital flows on growth in emerging markets.

The construction of our AH instruments show that our variables of interest, when we utilize the second level lag a full explanatory variable set have a first step explanatory power of 0.52 for $VSTF/RES$ and 0.26 for $VSTF/GDP$. Table 5 presents the results obtained from the IV regressions for the developing sample, which present the main idea behind the paper. Any departures from conventional results for the full or rich country sample will be duly noted. For the 'difference' and 'system' estimator we report the first step results of the estimations, since the second step estimates have a severe downward bias in their standard errors. Also, the Sargan test of overidentified restrictions as well as tests for autocorrelation in the error structure are presented. The null hypothesis for these tests should be accepted for valid estimations.[38]

The results in Table 5 show that the instruments for our variables of interest are not only significantly negative, they are also robust across the spectrum of estimation methods. Wald tests confirm that our point estimates for $VSTF/RES$ and $VSTF/GDP$ are not significantly different from each other. These IV-results confirm the initial findings of significant negative impact on growth from short term capital flows in emerging markets. Moreover, when we compare the results in Table 4, Panel I and the results obtained from the 'system' estimation we see that they exhibit some similarities. We have to keep

[38] The serial correlation test for the AH estimations is suggested by Drukker (2003) and Wooldridge (2002), while the tests for serial correlation in the GMM estimations are suggested by Arellano and Bond (1991).

in mind that the results in Table 4 are subject to panel heteroscedasticity correction, while the GMM estimates are not. If the regressions in Table 4 are conducted without the correction, the results obtained show no sinificant differences. Wald tests of all variable coefficients and model Hausman tests confirm this by accepting the null of no differences.

Table 5: IV-Regressions for the effects of Short-term capital flows on growht.

	Panel Regressions, 1970-2000. Developing countries.					
	AH^a	AH^a	*Difference*^{b}	*Difference*^{b}	*System*^{c}	*System*^{c}
InY	−8.39	−17.85*	−1.62	−1.72	−1.72*	−2.17**
	(0.99)	(1.93)	(0.88)	(0.94)	(1.97)	(2.65)
INV	−0.56	−0.59	0.02	0.07	0.07*	0.06*
	(1.18)	(1.27)	(0.28)	(0.85)	(1.94)	(1.82)
EDU	17.35	21.76	−0.03	0.34	0.28	0.34**
	(0.50)	(0.58)	(0.05)	(0.59)	(1.61)	(2.03)
VSTF/RES	−2.49**		−3.05***		−1.85**	
	(2.16)		(3.03)		(2.30)	
VSTF/GDP		−25.83*		−33.26**		−26.67**
		(1.94)		(2.32)		(2.38)
CAR	−4.56	−5.51	0.23	0.25	0.64	0.57
	(0.84)	(0.94)	(0.25)	(0.28)	(1.04)	(0.94)
OPEN	−0.27*	−0.28*	−0.01	−0.01	0.01	0.02**
	(1.79)	(1.81)	(0.76)	(0.64)	(1.56)	(2.03)
Sargan test			0.99	0.94	0.60	0.69
Serial corr. test	0.84	0.71	0.15	0.03	0.27	0.24

Note:*, ** and *** denote significance at the 10, 5, and 1% levels respectively. Time dummies included.
^{a} Regressions corrected for cross-sectional heteroscedasticity, |t|-statistics in parenthesis.
^{b,c} |t|-statistics in parenthesis.

These findings lead us to believe that: a) any potential omitted variable bias in Panel I is of no importance and b) the model estimated in Panel I is correctly specified and not subject to potential endogeneity bias. Panel II in Table 4 on the other hand, which includes country specific fixed effects, seems to suffer from bias in the estimates.

If we try to link the results obtained to a more coherent explanation, then the following presents a possibility: Rich countries and developing countries differ in several aspects when it comes to growth promotion. The IV-results for the developed sample, even if not presented, show a consistency with Table 4, where openess has a positive significant effect on growth, while capital account restrictions have, in general, a negative effect on growth. For the emerging markets, the indications are that increased short-term capital flows as such are not clear-cut ways to prosperity. The indications are rather that increased openness to capital flows, especially short-term, and perhaps trade is something

countries embark on sequentially as they develop, in order to reap the benefits of growth. Interestingly, in Appendix I we see that, the variable $VSTF/RES$ has a much higher mean and maximum values for the developed countries than for emerging markets while the mean of $VSTF/GDP$ is higher for emerging markets than for developed economies. This could indicate larger financial fragility in emerging markets. Moreover, both variables, $VSTF/RES$ and $VSTF/GDP$, have a positive correlation with openness for the developed economies, while for the emerging markets the former is negative and the latter possitive. This could perhaps indicate that short-term capital flows are more related to some possible underlying real production in rich countries. Lastly, the fact that investment or education become insignificant in some estimations, both in Table 4 and 5, is not a cause of worry for several reasons. This is due to fact that we try to capture within country variation, which is necessary in order to capture the effects of short-term capital flows on growth. In addition, we should remember that in the standard cross-country setting these variables are indeed significant in explaining growth.

The results so far have been unanimously pointing toward the fact that short-term capital flows have a detrimental effect on growth for emerging markets, while no such indications exist for developed economies.[39] Even so, there are certainly objections to the estimations above. One could be the fact that we should be controlling for macroeconomic imbalances in an economy instead of controlling for trade and capital account liberalization. This follows on, to some extent, from the idea that a financial crisis can be triggered if a country suffers from unsustainable macroeconomic imbalances. Large and unsustainable macroeconomic imbalances will make countries 'riskier' and we will therefore observe larger short-term capital flow volatility.

One way to lessen potential objections and strengthen the results obtained from our estimations is to include additional control variables in our regressions. However the reestimation of all regressions for any additional control variable is a tedious and unnecessary task. Our results indicate that the esimations in Table 4, Panel I, have at least three advantages. Firstly, we do not incur any severe losses in degrees of freedom, secondly the estimates do not seem to be subject to potential biases and thirdly we can correct for panel heteroscedasticity. Hence, these estimations can serve as valid benchmarks and the results can be further examined by conductiong a robustness check through the application of an extreme-bounds analysis (EBA) in the spirit of Levine and Renelt (1992). By adding variables to our regressions we will be able to control for a variety of observables that may potentialy affect growth. The drawback is of course that we can not control for time invariant unobservables, as we do in a fixed effects specification. The EBA mirrors the approach adopted in cross-country regressions that search for growth determinants.[40]

[39] The variable $VSTF/GDP$ becomes slightly positive significant in the 'system' estimation, with a p-value of 0.093, for the developed sample. Otherwise, all other estimations show an insignificant impact of short-term capital flows on growth, both for the developed as well as the whole sample.

[40] See Sala-i-Martin (1997).

6 Robustness check

The sole purpose of this section is to investigate the robustness of the results obtained for emerging markets in my base regression. Since the main purpose of this paper has been to investigate the effects of short-term capital flows in emerging markets it follows quite naturally to restrict my extreme-bounds analysis to incorporate only emerging markets.

An EBA is used to test the robustness of coefficient estimates to alterations in the conditioning set of information. Levine and Renelt's (1992) (LR) empirical application of Leamer's (1983) EBA has adopted the common feature of cross-country growth regressions, where explanatory variables are entered independently and linearly, hence the EBA implies regressions of the form:

$$\Delta y = \alpha_j + \beta_{ij} I + \beta_{mj} M + \beta_{Zj} Z_j + \varepsilon \tag{5}$$

where Δy, is as previously per capita GDP growth, I is a set of variables always included in the regression, M is the variable of interest and Z_j is a subset of three variables chosen from a pool (Z) of additional control variables. The model has to be estimated for all possible combinations of $Z_j \in Z$. Each model j produces one point estimate of the variable of interest β_{mj} and its corresponding standard deviation σ_{mj}. The lower extreme bound is defined as the lowest point estimate $\beta_{mj} - 2\sigma_{mj}$ and the upper extreme bound as the highest point estimate $\beta_{mj} + 2\sigma_{mj}$. If β_{mj} remains significant and of the same sign *at the extreme bounds*, then we can maintain a fair amount of confidence that the partial correlation and the variable of interest can be considered to be *'robust'*, otherwise the variable will be considered *'fragile'*.

The I variables in this EBA will consist of the explanatory variables in the base regressions made in the previous chapter namely: Initial GDP (ln Y), investment (Inv), education (Edu), capital account restrictions (CAR), and openess (OPEN). The M variables are as always: short-term flows to reserves ($VSTF/RES$) or short-term flows to GDP ($VSTF/GDP$). The pool of Z variables consists of variables that have been used in Sala-i-Martin (1997), Levine and Renelt (1992) or Fölster and Henrekson (2001). In order to restrict the number of Z variables we can discard variables that are constant over time (such as land area), that are not available for parts of the timeframe examined, or that are simply irrelevant for the sample of countries used in this analysis (such as revolutions and coups). The final selection of the Z pool consists of the following ten variables: Government share of GDP (GOV), growth of government share (GOVG), overall bugdet balance as a share of GDP (BUDGET), inflation (INF), the standard deviation of inflation (SDINF), the share of urban population (URBAN), log of life expectancy (LIFEX), labor force growth (LFG), current savings (SAVE), and the growth of the consumption share of GDP (CONSG).[41] All variables are instrumented by their first lagged level.

[41] This implies $\binom{10}{3} = 120$ possible combinations of $Z_j \in Z$ for each of the variables of interest.

Lastly we can note that the first five variables can be viewed as controls for various potential macroeconomic imbalances.

There are several objections against the LR methodology. One is that it introduces multicollinearity, inflates the coefficient standard errors and exaggerates the range on the coefficient of interest. This multicollinearity problem is though of, according to LR (1992), as a reflection of a weak-data problem . Another objection is brought forward by Sala-i-Martin (1997). He notes that there is a 'reverse data-mining' problem. If you try different combinations of control variables it is almost guaranteed to find one or several combinations of control variables that renders the coefficient of interest insignificant or even causes it to change sign. In this sense the EBA may be 'too strong'. On the other hand if the variable(s) of interest passes a test that is 'too strong' it should be considered as 'good news', that is by passing a 'too strong' test, they should not have problems passing any weaker tests.

The results from the robustness test for the regressions on my emerging markets sample using ten conditioning variables are presented in Table 8. Where the 'Base' refers to the regression estimates in Table 4 and does not include any Z variables.

Table 6: Sensitivity results for Emerging markets
Weighted panel regressions, 5-year averages (1970-00)

	M-variables:					
	VSTF/RES			*VSTF/GDP*		
	High	**Base**	**Low**	**High**	**Base**	**Low**
β	−3.64	−2.47	−2.13	−44.52	−35.72	−30.75
S.E.	0.69	0.66	0.72	8.96	8.91	9.57
$t-stat.$	−5.25	−3.72	−2.96	−4.97	−4.01	−3.21
$Z-variables$	*LFG* *LIFEX* *GOV*		*SDINF* *CONSG* *SAVE*	*LIFEX* *BUDGET* *GOV*		*INF* *GOV* *SAVE*
Obs.	70	70	68	69	70	68
R^2	0.55	0.50	0.51	0.56	0.55	0.55
Robust/Fragile		**Robust**			**Robust**	

Table 6 shows that the estimated effects for $VSTF/RES$ and $VSTF/GDP$ are robust with respect to the stringent EBA criterion. Both lower and upper bounds are significantly different from zero and both bounds are negative. Overall, the results of the EBA seem to imply that we can maintain a fair amount of confidence that the negative results between short-term capital flows and economic growth for emerging markets is 'robust'.[42]

[42] The variables STF/RES and STF/GDP are within the EBA bounds and significant even if I only regress them on growth together with the period dummies. Additional explanatory

7 Conclusions

Recent financial crises around the world have drawn a lot of attention to themselves. It seems that financial markets are prone to herding, panics, contagion and boom-bust cycles. Empirical studies have found that short-term flows increase financial fragility and increase also the probability of financial crises. This study has taken a macro-oriented approach and the results support the notion that that high and volatile short-term flows are growth inhibiting for emerging markets. This is not the case though for rich countries which have an insignificant experience from short-term capital flows. The results concerning the negative effects of short-term capital flows on growth for emerging markets seem to be robust for different estimation methods and pass stringent EBA criteria.

Euclides is supposed to have said to Ptolemaios: "There is no 'royal road' to geometry." The results here indicate that there is no 'royal road' to prosperity either by opening up emerging markets capital accounts, which imply increased short-term capital flows. There is no argument that good prudential regulation, that is enforced, and well-developed institutions, both national as well as international, will counteract 'excessive' short-term flows so that the benefits of capital account liberalization exceed the costs. The question, for future research, is what kind of institutions need to be developed? Should emerging markets focus on a broader anticorruption strategy, or should they focus on pure financial market regulation, or both? In the meanwhile there is growing evidence that controls can be effective in discouraging short-term flows. The Chilean experience has shown that restrictions have affected the maturity composition of flows, but not their overall volume. In conclusion, if indeed short-term capital flows are growth inhibiting for emerging markets, they should discourage them, perhaps by imposing some form of controls in the short run and by developing better institutions in the log run.

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variables, from the base model to the EBA approach do not alter the results. Moreover, we can note that the EBA results are robust in a fixed effects setting as well. However, we can keep in mind that the set of Z variables used is far from a complete and perhaps there is another set with a combination that is able to reverse the results.

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Appendix I: ***Descriptive statistics and Correlation matrices.***

Descriptive Statistics

	VSTF/RES		*VSTF/GDP*	
	Developed	*Emerging*	*Developed*	*Emerging*
mean	0.44	0.37	0.024	0.032
std	0.54	0.39	0.027	0.031
max	4.32	1.98	0.16	0.19

Correlation matrix of explanatory variables, All countries.

	InY	*INV.*	*EDU.*	*CAR*	*OPEN*	*VSTF/RES*	*VSTF/GDP*
InY	1						
INV.	0.19	1					
EDU.	0.69	0.18	1				
CAR	−0.62	−0.25	−0.45	1			
OPEN	0.03	0.56	−0.09	−0.22	1		
VSTF/RES	0.20	−0.19	0.17	−0.24	−0.12	1	
VSTF/GDP	0.26	0.21	0.05	−0.34	0.58	0.47	1

Correlation matrix of explanatory variables, Developed markets.

	InY	*INV.*	*EDU.*	*CAR*	*OPEN*	*VSTF/RES*	*VSTF/GDP*
InY	1						
INV.	0.05	1					
EDU.	0.50	−0.02	1				
CAR	−0.71	0.12	−0.43	1			
OPEN	−0.03	−0.18	−0.05	0.03	1		
VSTF/RES	0.32	−0.33	0.24	−0.39	0.11	1	
VSTF/GDP	0.39	−0.23	0.14	−0.41	0.48	0.70	1

Correlation matrix of explanatory variables, Emerging markets.

	InY	*INV.*	*EDU.*	*CAR*	*OPEN*	*VSTF/RES*	*VSTF/GDP*
InY	1						
INV.	0.18	1					
EDU.	0.54	0.23	1				
CAR	−0.35	−0.42	−0.19	1			
OPEN	0.32	0.72	0.05	−0.51	1		
VSTF/RES	−0.04	−0.21	−0.03	0.10	−0.27	1	
VSTF/GDP	0.45	0.48	0.15	−0.39	0.71	0.11	1

Appendix II: ***Development of Short-Term Capital flows in selected countries.***

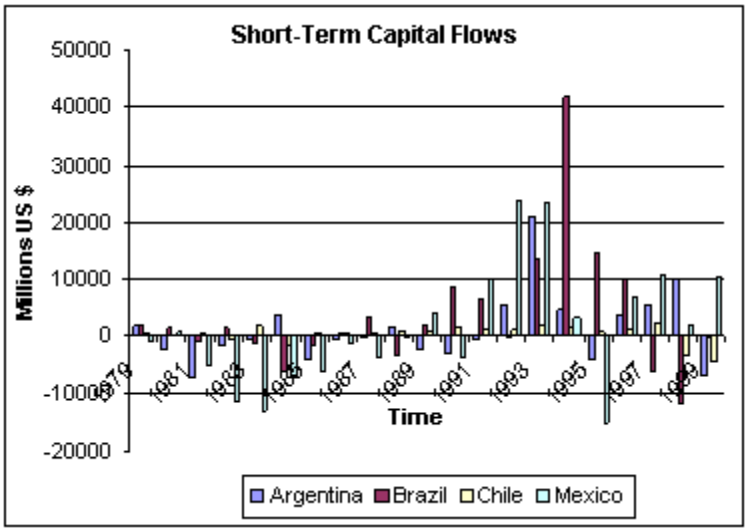

Figure 1: The development of short-term capital flows in millions of U.S dollars in selected Latin-American countries from 1979-1999.

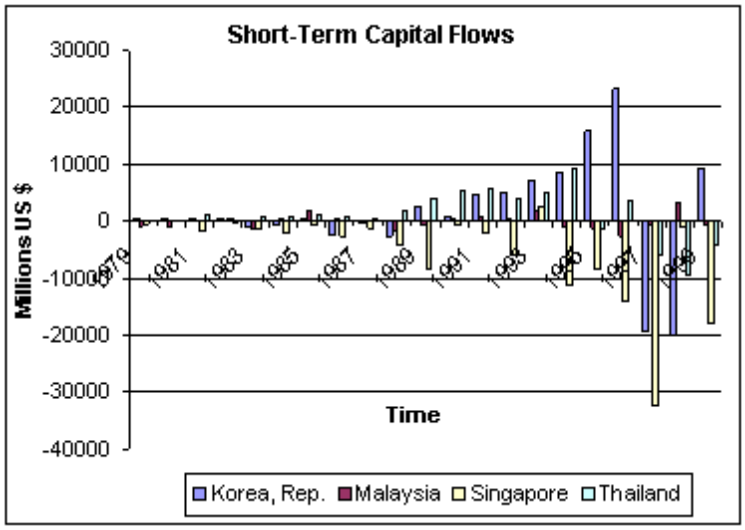

Figure 2: The development of short-term capital flows in millions of U.S dollars in selected East-Asian countriesfrom 1979-1999.

Appendix III: ***Data description of EBA variables.***

Name	**Description**	**Source**
GOV	Government share of GDP, percent, current prices.	PWT 6.1
GOVG	Growth of Government share of GDP, current prices.	PWT 6.1
SAVE	Current savings, percent, current prices.	PWT 6.1
CONSG	Growth of Consumption share of GDP, current prices.	PWT 6.1
URBAN	Urban Population, percent of total.	WDI 2000 Data on disk
LIFEX	Log of Life Expectancy at birth, no. of years.	WDI 2000 Data on disk
INF	Annual inflation, percent.	WDI 2000 Data on disk
SDINF	Standard Deviation of Inflation, calculated using inflation.	WDI 2000 Data on disk
LF	Growth of Labor Force, annual percent.	WDI 2000 Data on disk
BUDGET	Overall Budget Balance, percent of GDP.	WDI 2000 Data on disk